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4 April 1980

USSR Report

ENERGY

No. 5

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ELECTRIC POWER

POLISH TRADE JOURNAL SUMMARIZES SOVIET ATOMIC ENERGY DEVELOPMENT PLANS

Warsaw RYNKI ZAGRANICZNE in Polish No 20, 15 Feb 80 p 5

[Unsigned article: "Soviet Plans for the Development of the Atomic Power Industry"; see also JPRS 74649, 27 November 79, USSR Report TRANSLATIONS FROM KOMMUNIST No 14, September 1979 pp 19-31, in article by N. Dollezhal' and Yu. Koryakin: "Nuclear Power Operation, Achievements and Problems."]

[Text] (JD) The Soviet Union is among the world's leaders in the development of nuclear technology and the production of facilities and equipment for fission power industry. As is universally known, it also was the world's first country to have installed (in Obninsk) an experimental reactor. The reactor's capacity was barely 5 MW. That was in 1954. Now, however, the capacity of reactors installed in currently planned or built plants is mostly 1,000 MW.

The activation of the large-scale "Atommash" complex rising near Volgodonsk (in southern RSFSR) will contribute to streamlining and accelerating the construction and deliveries of high-capacity (1,000 MW) PWR type reactors. The "Atommash" construction delays are estimated at 2 years. The first 1,000 MW reactor is expected in about 1982 and subsequently that plant is scheduled to build three large reactors annually.

Changes as regards streamlining reactor production within the framework of the CEMA also are expected. So far the Izhorsk Plant (south of Leningrad) has been supplying 440-MW reactors, but in the future facilities of similar capacity and type, i.e., PWR [pressurized water reactors], will be produced in Czechoslovakia (according to a Soviet design). The cooperation program, in which all the European member countries of the CEMA (except Romania) participate, postulates that the pressure vessels and the assembling of the fuel core will take place in the USSR and the Czechoslovak SSR.

At present the aggregate reactor capacity of the Soviet Union is nearly 10,000 MW. By the end of 1980 it was to reach 18,500 MW. Latest estimates show, however, that actually these targets will not be accomplished.

Toward the end of 1979 the capacity of the existing atomic power plants totaled 8,825 MW. Plants with a combined capacity of 13,765 MW are under construction, and the plans provide for the installation of an additional 14,000 MW. Thus, the aggregate capacity of the existing, under-construction, and planned reactors is estimated at 36,590 MW.

In the European part of the USSR, where the demand for electrical power is the highest, 10 atomic power plants already are in operation. Currently about 5 percent of the total electric power output in the USSR is provided by atomic power plants, while during the next 10-year period this share is to increase to 20-25 percent. The estimates for the year 2000 postulate that by then 20 percent of the nation's total energy demand--and the whole of the electricity demand of the European part of the USSR--will be satisfied by atomic power plants. Other, higher estimates also exist.

The development of atomic power industry is of fundamental importance to the economy of the USSR. The siting of the power plants in its European part of the USSR is due chiefly to economic considerations, since this is where some 75 percent of electric power is consumed. Since that region lacks its own large deposits of petroleum and coal, these fuels have to be brought in from, among other places, West Siberia, which markedly augments their cost. Hence also, as is estimated, the generation of power by atomic plants is about 30 percent cheaper than the generation of power by conventional heat and power plants. However, the problem of the installation of additional atomic power facilities in the European part is also considered from the standpoint of safety. The authors of an article concerning the achievements and problems of the atomic power industry which was published in an issue of the biweekly KOMMUNIST (N. Dollezal' and Dr. Y. Koryakin), suggest that in view of, among other things, the considerable consumption of water, the question of arable lands, and the problems relating to the disposal of radioactive wastes, other sites would be more expedient. Instead of building the power plants in the densely populated European regions of the RSFSR, in which 50 to 70 plants are planned for the future, the authors propose solutions similar to those adopted in the West. This concerns siting the power plants within self-contained enclosures at a distance from large urban centers and establishing so-called atomic parks. The Leningrad Electric Power Plant, whose capacity will soon increase to 4,000 MW (four graphite-water reactors of the channel type) is the largest plant of its kind in all Europe. It is located in Sosnovyy Bor, 72 km from Leningrad. Voronezh--the center of the Soviet aircraft industry--is supplied with power from five reactors installed in the Novo-Voronezh Power Plant. In addition, further expansion of atomic power plants in the European part of the USSR is being planned--for example, the Kursk, Smolensk and Chernobyl' plants, as is the activation of a network of plants of this type in, chiefly, the Ukraine. These would supply electric power to CEMA member countries.

The plans for the coming 10-year period include the construction of breeder reactors on a larger scale: such reactors assure a particularly economical consumption of fuel. By the end of this year a reactor of this type (with 600 MW capacity) is to be activated in Beloyarsk.

[Table] Atomic Power Plants in the USSR

	A	B	C	D
Existing:				
Obninsk	1	LWGR[a]	5	1954
Trotsk	6	LWGR	100	1958-1962
Beloyarsk 1	1	LWGR	100	1964
Beloyarsk 2	1	LWGR	200	1967
Leningrad	2	LWGR	1,000	1973-1975
Bilibinsk	4	LWGR	12	1973-1976
Chernobyl'	1	LWGR	1,000	1977
Kursk	1	LWGR	1,000	1976
Novo-Voronezh 1	1	PWR[b]	210	1964
Novo-Voronezh 2	1	PWR	365	1969
Novo-Voronezh 3, 4	2	PWR	?	1971-1972
Novo-Voronezh 5	1	PWR	1,000	1978
Kola	2	PWR	440	1973-1974
Armenia	1	PWR	405	1976
Ul'yanovsk	1	FBR[c]	12	1962
Shevchenko	1	FBR	120[d]	1973
Under construction:				
Leningrad	2	LWGR	1,000	
Kursk	2	LWGR	1,000	
Chernobyl'	1	LWGR	1,000	
Smolensk	1	LWGR	1,000	
Ignalina	2	LWGR	1,500	
Kola	2	PWR	440	
Armenia	1	PWR	405	
Kalinin	1	PWR	1,000	
Southern Ukraine	1	PWR	1,000	
Rovno	2	PWR	440	
Beloyarsk	1	FBR	600	
Planned:				
Kursk	1	LWGR	1,000	
Chernobyl'	2	LWGR	1,000	
Smolensk	1	LWGR	1,000	
Kalinin	3	PWR	1,000	
Southern Ukraine	3	PWR	1,000	
Western Ukraine	4	PWR	1,000	

A. Number of reactors; B. Reactor type; C. Unit capacity in MW; D. Year of activation;

a) Large-capacity boiling reactor: this is a type that is relatively unpopular abroad and is otherwise termed the water-graphite reactor of the channel type. In Soviet nomenclature the abbreviation for it is RBMK, and in British, sometimes, PTR (pressure tube reactor);

b) Pressurized water reactor, a type also popular in the West. (In Soviet nomenclature it is referred to as VVER);

c) Fast breeder reactor. In Soviet nomenclature referred to as BN.

d) This reactor not only generates electric power but desalinates (distills) sea water in the amount of 50,000 cubic meters daily. Its overall capacity is 350 MW.

Note: In Obninsk there also exists a fast-neutron experimental (5 MW) reactor, and in Ul'yanovsk, a boiling reactor (BWR) (of 50 MW capacity).

1386
CSO: 2600

HIGH-CAPACITY SOLAR POWER PLANT DEVELOPED

[Editorial Report] Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian on 31 January 1980, page 4, reports that Doctor of Technical Sciences V. Veynberg and engineer B. Lavrinovich, both of Leningrad, have developed a plan for a high-capacity solar power plant. The plan has earned praise from the Solar Power Engineering Commission of the All-Union Council of Scientific-Technical Societies. Candidate of Technical Sciences Boris Valentinovich Petukhov, chairman of the commission and an engineer who has built dozens of large solar heating units, notes, for example, that the calculations of Veynberg and Lavrinovich indicate a possible output of 60,000 kilowatts per square kilometer of reflector area in Central Asia. A cascade of solar plants could achieve an output of several million kilowatts. Petukhov says that in the future a system of such plants could be built in the southern part of the USSR. The plan includes features which overcome some problems associated with large-scale installations. For example, instead of conventional lenses or fiber lightguides, the plan calls for a new type of lightguide with 'hollow' lenses, designed to conduct sunlight from reflectors directly through the air, with no loss of light. The guide consists of transparent, refracting frames spaced at intervals. They cast no shadows on the reflectors. The problem of interruption of the plant's operation at nightfall can be overcome by stretching out areas of reflectors over long distances. A line of areas 1000 kilometers long would extend the operating time by two hours, while a line extending 12,000 kilometers would provide almost 24-hour operation.

CSO: 1822

ELECTRIC POWER

HIGH-VOLTAGE LINES LINK KATEK WITH CONSUMERS

Bonn DIE WIRTSCHAFT DES OSTBLOCKS in German 4 Dec 79 p 1

[Excerpts] The area of Krasnoyarsk in East Siberia will soon be the Soviet Union's largest producer and supplier of electric power. It will stanch the evergrowing need for electric power in Siberia as well as the European part of the USSR. The "center" of the energy supply will be KATEK [Kansk-Achinsk fuel-energy complex]. This complex is under construction south of Krasnoyarsk. Some 10 years ago colossal lignite deposits were discovered along the Trans-Siberian Railway. From this reservoir it is possible to extract over 140 billion tons of lignite. The 65,000 square kilometers of area bordering KATEK alone hold a year's supply of as much as a billion tons of lignite. Additionally, the area has the electric power reserves of the Yenisey, where one of the largest hydroelectric power stations in the world is located, the Sayano-Shushenskaya GES, with a capacity of 6400 megawatts.

The KATEK energy center will be connected with the European part of the USSR via "fantastic energy bridges." This means high-power voltage lines with capacities of 1150 and 2250 kilovolts. One of the first of these lines will be laid over a distance of more than 4000 kilometers to the Ukrainian industrial center Khar'kov. Khar'kov will have access to the cheapest power; the cost for production and transmission up to now should amount to all of 0.9 kopecks.

CSO: 1822

ELECTRIC POWER

INSTITUTE OF HIGH TEMPERATURES INVOLVED IN NEW ENERGY GENERATION PROCESS

Stockholm SVENSKA DAGBLADET in Swedish 8 Dec 79 p 14

[Article by Hans Rehnvall]

[Text] Soviet technicians are now ready to build an entirely new type of power plant which directly transforms the energy in hot gas into electricity. The power plant, which will be built 20 miles south of Moscow, will be powered by natural gas and will have a much higher degree of efficiency and less emission than ordinary power plants.

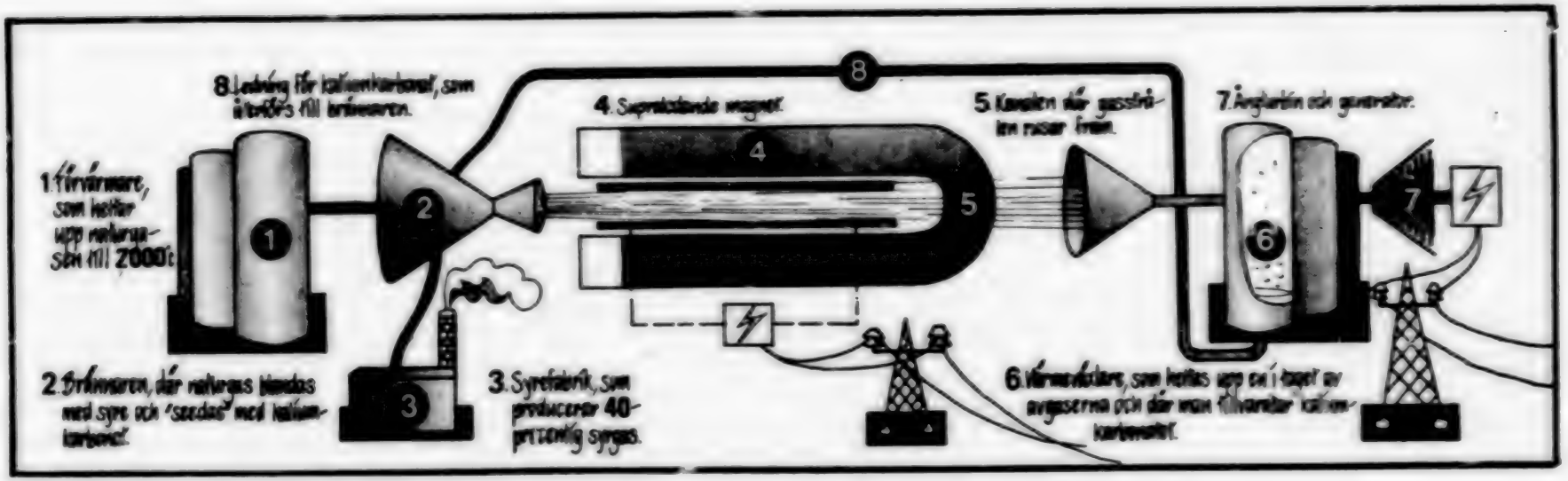
It will be capable of producing 500 megawatts of electricity--the same amount as a small nuclear power plant.

The principle of transforming the energy from a stream of hot gas into electricity has long been a Soviet speciality and they have been developing the idea together with American scientists. In the West the method has been regarded as much too difficult technically--but now the Russians believe they have solved so many of the problems that it is time to take the step of building a commercial facility.

"There will be a 20-percent fuel saving compared with a conventional plant," Academy member Alexander Sheindlin told SVENSKA DAGBLADET. Dr Sheindlin is the head of the Institute for High Temperature Research which is responsible for developing the power plant.

"The consumption of cooling water will be one and a half times less and there will also be a reduction of exhaust gases," said Dr Sheindlin. "This is a big step forward--although nuclear power and other energy sources are available intensive use of fossil fuels is still necessary."

The principle behind the new power plant is actually simple and is easiest to understand if one recalls the demonstration in physics class of how an ordinary generator functions. One takes a single coil of copper wire and allows it to rotate so that the copper wire moves in a magnetic field. This induces current in the copper wire.



Key:

1. Preheaters for heating natural gas to 2000° C.
2. Burner where natural gas is mixed with oxygen and "seeded" with potassium carbonate.
3. Oxygen factory for producing 40-percent oxygen.
4. Superconductive magnet.
5. Channel through which the gas jet flows.
6. Heat exchangers that are heated one at a time by exhaust gases. The potassium carbonate is reclaimed here.
7. Steam turbine and generator.
8. Pipeline for the potassium carbonate that is returned to the burner.

The reason, quite simply, is that something conductive must move in a magnetic field. This "something" does not have to be a copper wire--and that is the idea behind the so-called MHD or magnetic hydrodynamic generator.

In it a jet of gas flows toward a highly magnetic field. A powder of suitable material is mixed with the gas jet, making the jet conductive. Metallic disks, electrodes, which pick up the current induced in the jet of gas are placed around it.

Although the principle is quite simple (at least no harder to grasp than the principle behind any kind of generator) technical implementation has proved to be quite difficult.

The Institute for High Temperature Research, located in the outskirts of Moscow, began its work on MHD in 1956--a short time after the very first laboratory apparatus was tested in the United States.

Cooperation With United States

"From the very start we concentrated on a system that could function as a power plant," Dr Sheindlin said. "In 1964 we built the first pilot plant--in Moscow. It is still in operation and is fired with coal. In 1971 came a new and larger pilot plant in connection with the research institute. It is fueled with natural gas.

"We cooperate extensively with American scientists and 2 years ago we obtained an American superconductive magnet--the largest of its kind."

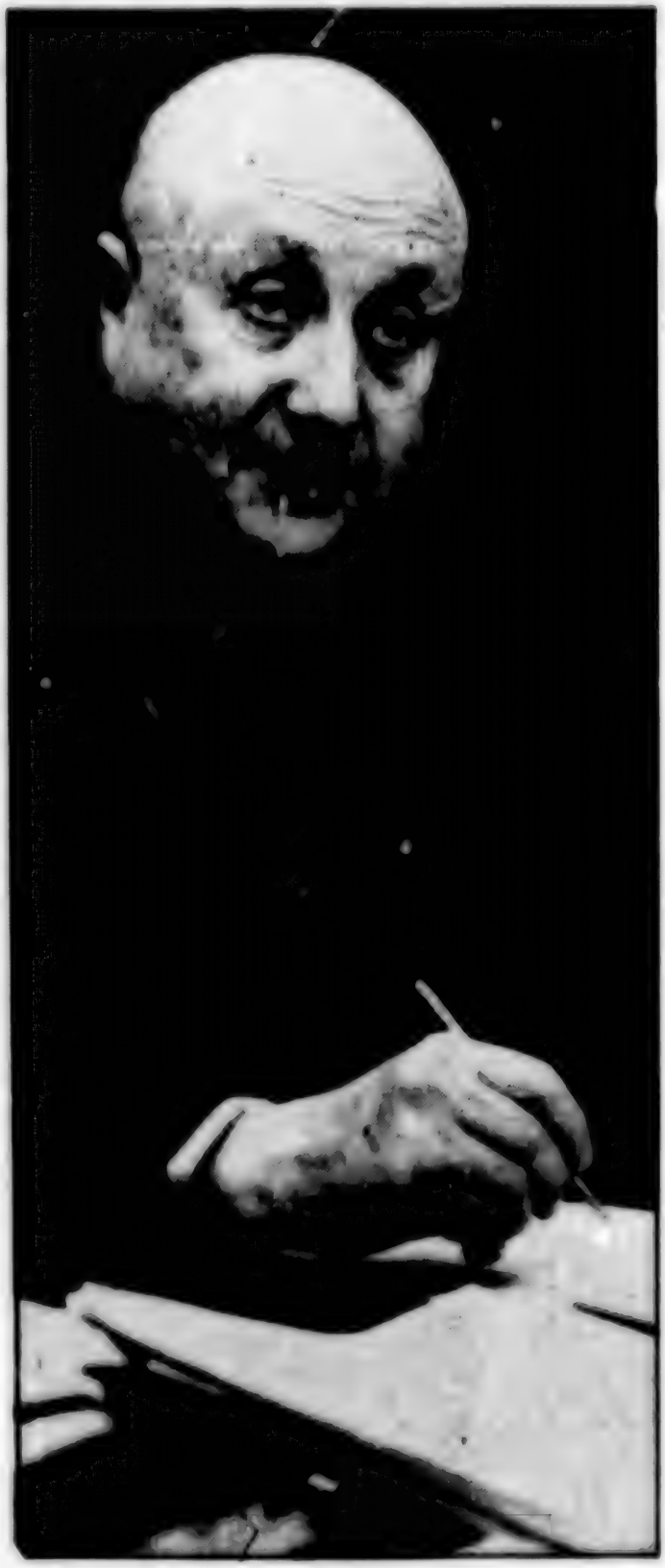
The magnetic field must be extremely strong for an MHD generator to be economical and according to Dr Sheindlin superconduction is essential.

At the same time this illustrates the technical problems. The winding of a superconductive magnet must be cooled to a few degrees above absolute zero and the 3000° gas jet flows between the poles of the magnet!

The pilot plant currently in operation consists of the same parts as the future commercial plant--but the temperature, magnetic field and other values are slightly lower. The natural gas and air are preheated to a temperature of 1200° while in the "real" plant it will go up to 2000° C. before the gases go into the burner which strongly resembles a rocket engine for a space ship.

Oxygen Added

To further increase combustion and energy development in the burner they blow in not pure air but a 40-percent oxygen mixture (air contains 21 percent) from a special oxygen factory.



Academy member Alexander Sheindlin is head of the Institute for High Temperature Research which is responsible for development of the power plant.

"One of the most important technical problems we have solved concerns the substance to be mixed with the gas to make it properly conductive," Dr Sheindlin told us. "We mix in potassium carbonate. This doesn't just disappear along with the exhaust fumes, it can be reclaimed. We do this in the special heat exchanger towers where the exhaust gases go after having passed through the MHD generator.

"The gas is conveyed to one of the towers where it heats up ceramic substances. When one of the towers is hot the gas is shifted over to the next one. The carbonate powder can sink to the bottom and be reused.

Exhaust Gas Heat

"The heat from the substances in the towers is then used to produce steam for an ordinary steam turbine with the generator. In all this 'exhaust gas heat' accounts for about half the production of the power plant--but the overall efficiency is 20 percent higher than if we used conventional methods alone," Dr Sheindlin.

A 20-percent improvement means a lot for this technique since methods of using fossil fuels to produce electricity are otherwise regarded as being far inferior to what is theoretically possible.

"Today we are not concerned with using MHD for nuclear energy, even though it is theoretically possible," Dr Sheindlin said. "That is due mainly to the fact that the high temperatures needed for efficient MHD operation cannot be achieved in nuclear reactors--with the present technology. The knowledge we acquire from MHD with fossil fuel can be applied to nuclear power in the future."

6578
CSO: 3109

GREAT PROGRESS CLAIMED FOR UZBEK POWER SYSTEM

Tashkent PRAVDA VOSTOKA in Russian 23 Dec 79 p 3

[Article by A. Khamidov, Uzbek SSR Ministry of Power and Electrification: "Uzbekistan's Power Workers' Progress"]

[Text] Yesterday the country observed the power workers' holiday.

Power engineering is a leading branch of socialist industry, which determines modern scientific and technical progress in all sectors of the national economy. The deep wisdom of the brilliant Leninist slogan, "Communism is Soviet power plus electrification of the whole country," is being revealed increasingly, with each day.

Uzbekistan's power workers have received the results of the November 1979 CPSU Central Committee Plenum and L. I. Brezhnev's speech, which gave a comprehensive analysis of the key problems of our country's social and economic development, with a feeling of great satisfaction and deep approval. One of these problems is the fuel and power complex and, primarily, its base--electric-power engineering and electrification.

The capacity of the electric power stations of Uzbekistan's power system has now reached 8 million kw. In the first 4 years of the five-year plan alone about 1.8 million kw of new generating capacity was introduced in the republic. And indeed this figure exceeds the tasks of the GOELRO [State Commission for the Electrification of Russia] plan calculated for 10-15 years for the whole country!

The dynamics of the quantitative indices for the development of Uzbekistan's power engineering are accompanied by broad scientific and technical progress of the industry. This is, primarily, the creation of a unified power system for Uzbekistan that has an adequately reliable and stable electric-power connection with the power systems of the fraternal Central Asian republics and of South Kazakhstan. A high level of concentration of the generation of electricity at large electric-power stations--Syrdar'inskaya, Tashkentskaya and Novoiyskaya--has been demonstrated.

Today Uzbekistan is a region of unbroken electrification with a high coefficient of power-supply centralization. Electric-power transmission lines stretch for more than 160,000 km, reaching the most remote villages. Twenty-four highly economical power blocks are in operation in the republic's power system.

The wide use of an automated system of dispatcher-type central control and the execution of a set of organizational and technical measures for raising the economy of equipment operation has enabled specific fuel consumption for the production of electricity to be reduced below the annual plan tasks since the start of the five-year plan. More than 120,000 tons of standard fuel equivalent have been saved.

Rejoicing at the successes, we still have, at the same time, many unused reserves. Thus, at the Syrdar'inskaya GRES the actual specific fuel consumption still exceeds the design-computed indicators. At the Ferganskaya TETs and the Angrenskaya GRES, reserves for savings of electricity expended on in-house needs have not been brought to bear completely, and the equipment at the Takhiatashskaya GRES is not operating reliably enough.

More complete and effective use of electrical capacity, further improvement of the operating regime of the power stations, accelerated mastery of power blocks, and a rise in the quality and a reduction in the time spent on repair work--these are reserves that should be brought into action.

The great work done by enterprise collectives has enabled the power system to fulfill ahead of schedule the goal of reducing the consumption of electricity in the grids on its transmission. The achieved level--7-7.2 percent--is one of the best indicators of the Union's power systems. The electricity saved during the elapsed period of the five-year plan has been impressive: it is enough, for example, for the power equipment of all the republic's food-industry enterprises for a year.

But, despite the creation of a high-powered and qualitatively new power base, the accelerated development of Uzbekistan's productive forces persistently requires an outstripping pace in the construction of new power blocks.

The republic's power units of tomorrow are the Novo-Angrenskaya GRES, whose first power blocks should go into operation in 1982, and the Talimardzhanskaya GRES, a new thermal electric-power station in Kashkadar'inskaya Oblast with a capacity of 3.2 million kw. Work on the construction of this power-engineering giant will be started in 1980. The distribution network will be expanded considerably, and a large number of cable lines will be introduced. Centralized district heating from Uzbek SSR Minenergo [Ministry of Power and Electrification] heat sources will be further developed.

Plans....Several years will pass before they are transformed into reality. The guarantee of this is the creative activeness, the patriotic enthusiasm and the labor accomplishments of socialist competition participants.

The collectives of the Order of Labor Red Banner Tashkentskaya GRES imeni 25th CPSU Congress, the electrical department of the Angrenskaya GRES and the boilerhouse of the Severo-Vostochnaya in Tashkent have achieved the best results. The Khodzhaabad region of Andizhanelektroset' [Andizhan Electric-Power Grid] and the Bulungur region of Samarkandelektroset' [Samarkand Electric-Power Grid] have been recognized as the best regions of the electric-power grids.

More than 1,000 engineering, technical and white-collar workers of the power system have been awarded the emblem, "Winner in Socialist Competition for 1979," and 300 people the emblem, "Shockworker of the Tenth Five-Year Plan," for successful fulfillment of annual goals and adopted commitments. Among them are power-block machine operator of the Tashkentskaya GRES V. Kozlov, on whose personal account 250 tons of fuel were saved, senior foreman V. Gerasimov of the Tashkent Enterprise of the Electric-Power Grid and Kh. Ubaydullayev from the Namangan Enterprise, who were again awarded the title, Foreman of the Highest Class, electricians Sh. Makhmudov from Fergana and N. Sysoyev from Kashkadar', electrical mechanic O. Yergashev from the cascade of Chirchik GES's and welder S. Ramazanov from the Angrenskaya GRES.

The republic's power workers, just like all the Soviet people, unanimously approving the party's plans, are full of resolve to consolidate the successes that have been achieved and to promote still more widely socialist competition in honor of the 110th anniversary of V. I. Lenin's birth and the 60th year of Lenin's GOELRO plan.

11409
CSO: 1822

ELECTRIC POWER

CHARVAK DAM A PROTOTYPE FOR NUREK DAM

Tashkent EKONOMIKA I ZHIZN' in Russian No 10, 1979 pp 57-59

[Article by A. Yershov: "The Materialization of a Daring Concept"]

[Excerpts] The Charvak hydraulic engineering system is primarily a hydroelectric power station of 600,000 kw capacity and a reservoir with a capacity of 2 billion cubic meters that is formed by a 168-meter dam. It is true that today you will surprise no one with these figures. By way of comparison they will tell you at once about the Nurek hydraulic engineering system, with a GES of 2.7 million kw and a dam 300 meters high. But not by far does everyone to whom these figures are known understand that without the Charvak hydrosystem there would be no Nurek system. For the scientific and technical ideas that were incorporated in the construction at Nurek passed a reliable check in practice during the building of the hydrosystem at Charvak, which is more modest in scale. It became the singular live model on the basis of which daring scientific prognoses and original engineering solutions were approved. And, continuing the comparison with aircraft manufacturing, it can be said that the Charvak hydrosystem is the prototype. Its tests enabled the engineers to boldly design such special hydraulic engineering structures as the Nurek and then the Rogun, whose erection the builders have already begun. It is pertinent to note that the dam of the Rogun hydrosystem will rise to a height of 330 meters. And this in an area where earthquakes of force 9 are possible!

But let us return to our Charvak. Before us here is a 168-meter dam which spans a narrow rock canyon. It is earthen and masonry. Inside is loam, and above it is masonry. Prior to Charvak, siting such a system in a force-8 seismic zone was unknown to world experience in hydraulic engineering construction work. Before starting to design the hydrosystem on the Chirchik River, there was only a dam of 130 meters in the USA, and then in a less seismic area. Of course, the specialists could have adopted a solution that is traditional for such complicated mining-geology conditions--to propose the construction of a concrete dam. Such a variant was worked out for comparison. It turned out that erection of the most economical concrete dam, the so-called buttress dam, would require 5-6 million cubic meters of concrete. For this purpose it would be necessary to build several large plants, the raw materials for which would have to be hauled from far

away. Moreover, the concrete could not be laid without high-capacity cranes and other costly special equipment.

The hydrosystem's designers--engineers of the Central Asian Division of Gidroproyekt [Survey, Design and Scientific-Research Institute imeni S. Ya. Zhuk]--decided to travel an unbeaten path, to build the dam from inexpensive local materials that could be mined from quarries laid out alongside the construction site. The idea was approved. Cost of the adopted variant would be little more than half that of the concrete dam, and the time taken to build the dam was reduced considerably.

The core of the dam was filled with pure loam. This was done with 27-ton Belorussian dump trucks. I want to call attention to the words "with pure loam." This was the result of the innovative approach of the designers. At the time the Charvak hydrosystem was being erected, the opinion was widespread that the core of the dam had to contain a skeletal admixture, that is, the loam, before being laid, would have to be mixed with a rocky material that would not allow the core to be deformed.

Theoretical computations, studies on models and, finally, experimental dumping directly at the construction site swept away the doubts of the skeptics. The loam, as originally proposed by the designers, proved to be an adequately reliable material. And again the hydrosystem's builders could save both time and money--for mixing the enormous amounts of materials to be laid in the dam's body would require substantial resources, not to mention the increase in construction time.

Today this beauty of a dam is reliably holding back the once rampant Chirchik. The dam is living its life. And specialists have been tirelessly observing this life. For this purpose 2,000 different instruments were mounted in the body of the dam during its erection. They monitor the subsidence and pressure inside the dam, the filtration of the water going through it, and other parameters.

"The results of the measurements indicated that the theoretical computations and the laboratory studies were completely confirmed in practice," says one of the designers, chief engineer of the Central Asian Division of Gidroproyekt D. A. Zhigarev. "The processes within the dam have already begun to stabilize. The moisture and density correspond with the design. According to the design, even the subsidence and water filtration are lower than calculated. The dam has also undergone a check with earthquakes, to which it has been subjected more than once."

But not just the Charvak dam has become a distinctive step on the path of designing new, specially built hydrosystems in the mountains of Central Asia. There is still another complicated and interesting structure--the shaft spillway. At the Charvak hydrosystem it is 150 meters high. Each second 1,200 cubic meters of water can pass through its 11-meter diameter shaft. Prior to Charvak the engineers were acquainted with this type of spillway only in vuz texts.

Still another structure is the towerlike water intake of the Charvakskaya GES. It also was specially built. It is 90 meters tall. A similar water intake was also built later at the Nurek hydrosystem.

At Charvak, for the first time in domestic practice, new radial gates with adjustable compression, are able to hold back in tunnels the head of a 95-meter water column. Today this most complicated equipment already is being produced serially by plants, and the engineering concept has been pushed ahead--gates able to withstand a 200-meter water column are being designed.

The word "first" has been used for many things at the Charvak hydrosystem. It has, for example, become a proving ground for the testing of more modern and effective types of drilling and blasting operations. Here for the first time in domestic practice the contour blasting method, which permits the seismic effect of the explosion wave on the structure being erected to be reduced, has been worked out and introduced. For this innovation a group of specialists was awarded a Diploma 1st Class of the VDNKh SSSR [Exposition of Achievements of the National Economy of the USSR].

It is difficult to overestimate the importance of the Charvak hydrosystem on the economy of the Uzbek SSR and of south Kazakhstan. It will enable seasonal water run-off to be regulated and this water to be supplied to agriculture, industry and cities and communities of the Chirchik-Angren-Keles region, where there are large areas of land requiring irrigation and substantial tracts that still have not been developed. The region is known for its developed industry. Suffice it to say that the republic's hugest industrial center--Tashkent, the country's fourth largest city in point of population--has been located here.

The hydrosystem's GES is being used in a regime most valuable for the national economy--for peak power. The power station is able each year to generate 2 billion kw-hr of electricity that costs one-fifth to one-sixth the electricity generated at thermal stations that burn natural gas--the most effective fuel--in their boilers. But even this is not all. The Charvak hydrosystem has almost doubled the operating capacity of the existing Chirchik cascade of 16 GES's that are situated below it on the river's course.

Today it can be said boldly: the erection of the Charvak hydrosystem has completely paid for itself. Since the start of operation, Charvak has generated more than 8.5 billion kw-hr of electricity and directed 3.5 billion cubic meters of water to the needs of irrigation. It has been especially useful during dry years. The economists have calculated that improvements in conditions for irrigation alone have enabled an additional 230,000 tons of raw cotton and many other agricultural products to be obtained.

The value of the Charvak hydrosystem will grow with time. It will help to improve the water supply for 460,000 hectares of irrigable land and to develop another 150,000 hectares of virgin lands. Primarily large farms

that grow potatoes, cucurbit vegetables and grapes will be established on these lands, in order to provide these products to the population of Tashkentskaya Oblast industrial centers.

We cannot omit the fact that the creation of a large recreation area for the workers of Tashkent and nearby industrial centers has started around the artificial Charvak sea. In the long term, up to 170,000 people will be able to enjoy the Charvak shores in the summer, and winter recreation centers will be able to serve 65,000 people.

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ELECTRIC POWER

FURTHER PLANS FOR ATOMMASH EXPLAINED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Jan 80 p 2

[Excerpts] The preceding year will go down in the history of Atommash construction first of all as a year of early introduction of additional capacities for the production of reactor equipment for one million kilowatts, thus bringing the total capacity of Atommash to four million kilowatts. It was one of the concrete tasks set by the 25th CPSU Congress. Moreover, the following projects were completed: a plant of large-panel housing construction with a capacity of 140,000 square meters of residential housing a year, a TETs-2 power unit for 110,000 kilowatts, a sodium sulfate shop at the chemical plant which will play an important role in the protection of the air at Atommash.

I. Uchayev, First Secretary of the CPSU City Committee said the following in article published in the New Year's issue of "Sotsialisticheskaya Industriya": credit for the achieved success at Atommash should be given, chiefly, to the workers and specialists who left their homes and came to the Don Steppe to build the buildings of this enterprise unprecedented with respect to its scale and unique characteristics and to start series production of power reactors each of which is equal in power to thirteen Dneproges [Dnepr Hydroelectric Power Plants].

The goals for 1980 are considerable. A large volume of work has to be done on the second section of the main building of Atommash, as well as on the buildings of plants Nos 2 and 4. In building No 6, production of special electodes and fluxes will be started.

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THERMAL POWER STATIONS IN WEST SIBERIA PLANNED

Moscow PRAVDA in Russian 7 Jan 80 p 3

[Text] An article entitled "Electrical Rivers of the North" was published last year on 6 October. It analyzed the problems of the electrification of Western Siberia. As was reported by Minister P. Neporozhniy, the contents of the article were examined by the USSR Ministry of Power and Electrification. It was mentioned that the construction of an electric power station in Tyumenskaya Oblast operating on natural gas, and particularly accompanying oil gas, will make it possible to reduce its losses and will provide extensive possibilities for electric power supply to industrial regions of Siberia and the Urals.

The ministry has planned to build a number of electric power stations in Tyumenskaya Oblast for a total capacity of 3.6 million kilowatts. This will make it possible to take full advantage of accompanying gas, as well as to build over 20,000 kilometers of electric power transmission lines, including superhigh voltage lines. At the present time, the All-Union Construction and Installation Association "Soyuzzapsibenergostroy" for carrying out construction programs of electric power stations and high-voltage electric power networks and All-Union Industrial Association "Soyuzzapsibenergo" are being created.

The structure of the organizations engaged in the construction of electric power stations will be improved. It is planned to create specialized mobile subdivisions for individual types of jobs. Two new trusts have been organized for building electric power networks.

The ministry is strengthening the base of the construction industry in this region. A reinforced concrete plant is being built in Surguta. In Tyumenskaya Oblast, it is planned to build another plant of the same kind, as well as a crushing and sorting mill and an enterprise for manufacturing structures for electrical installations.

Measures are being taken to eliminate the lagging in the construction of Tobol'skaya TETs and housing for the workers of the Tobol'sk Petrochemical Combine.

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ERECTION OF SURGUT PLANT FOR GAS TREATMENT LAGGING

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 Jan 80 p 1

[Article by G. Kiksman (Surgut): "An 'Outsider' Construction Project"]

[Text] The correspondent's report, "And They Are Not Carrying It Out Successfully...," which was published in SOTSIALISTICHESKAYA GAZETA of 2 October 1979, spoke of unsatisfactory progress in construction of the Surgut Gas Treatment Plant. Yet the construction project is among the especially important ones: the plant has been called upon to supply the Surgut GRES uninterruptedly with fuel.

How did the general contracting trust, Zapsibenergostroy [Trust for the Construction of Power-Engineering Facilities in West Siberia], and USSR Minenergo [Ministry of Power and Electrification], to which the trust is subordinate, react to the criticism? They have been silent. But perhaps the managers decided that, in the final analysis, it is important to answer with deeds, not with a letter?

No, nothing has changed at Surgut. If the schedule is to be believed, I should have been a witness to a vigorous finish: turnover of the plant's first line for operation had been planned for back in December. But even in January the picture at the construction project was more reminiscent of an unhurried startup. The impression is left here that erection of the main and auxiliary production facilities had been started not 3 years ago but just recently: incompleted building frameworks and tens of unfinished footings for equipment are all around, and the below-grade work still has not been finished. At the facilities for the second line, everything is entirely calm: not even all the piles have been driven.

In brief, the fourth quarter of the past year did not introduce any basic change into the situation. Like the tasks of the two preceding years, the 1979 plan was barely half met. The result is not a happy one: during the time the plant has been under construction, of the 54 million rubles'

worth of work not even 20 million rubles' worth has been completed by the builders and installers.

Minnefteprom [Ministry of Petroleum Industry] and USSR Minenergo have now agreed on new deadlines for turnovers: the first line of the enterprise is to be put into operation during the second quarter, and the whole plant is to be completed at the end of this year. The amount of work to be done is not small, yet even in January the builders continue to advance just as slowly.

It would seem that, regardless of what the others do, the power workers should accelerate startup of the gas treatment plant with all their efforts: for the capacity of the Surgutskaya GRES is growing, as they say, not by the day but by the hour! And the general contractor at both construction projects is the same--Zapsibenergostroy. But how strikingly dissimilar these construction projects are! At the GRES facilities there is an ideal procedure, a strict pace and a precise schedule. At the gas treatment plant there is neither order nor work.

"And what do you expect?" remarks F. Shakirov, director of the enterprise that is under construction. "We have a constant 'famine' of personnel. There should be more than a thousand builders and installers at the construction project but there are not even 500."

"Soon there won't be any," burst out V. Vlasov, leader of a brigade of machinery installers, with irritation. "We are thinking of leaving. There is nothing for us to do here. We were figuring on working in three shifts but not even a full one goes out. It turns dark early during the winter, but there is no lighting of any kind at the site."

Their colleagues from Dvigatel'montazh [Trust for the Installation of Motors] were called here by telegram back in December, "because of the opening of a work front at the compressor stations." Brigades flew in from Omsk, Kuybyshev and Salavat--these are not nearby places. And at the right time they went right back: out of five compressors, only two were barely ready for installation.

A trifle, an organizational miscalculation? No. In this case it was the attitude of the general contractor toward the facility. Indeed, in many other cases also his attention toward this project has been just on paper. A conversation with A. Khabarov, chief of the PMK [mobile mechanized column] of Zapsibenergostroy, which is erecting the gas treatment plant, is recalled. In his words, almost everything was in confusion--because of the designers' poor work. They missed the deadlines for presenting documentation and they made too many amendments to it, and this disorganized construction. It was so disorganized, let us note, that the changed drawings of the trestle for the materials pipeline lay in the builders' files for almost the whole past year--from January until late autumn. This "forgetfulness" cost the machinery installers thousands of man-days and 20,000 rubles in supplementary wages.

Let us move over instantaneously to the vicinity of Nizhnevartovsk, where installation of the Belozernyy Gas Treatment Plant, whose capacity is equal to Surgut's, was completed recently in record time. What helped to speed up matters there? There were normal organization of work, normal living conditions, and a good production base. Simply speaking, they considered there the characteristics of the Siberian climate and began precisely on that basis. They built a production building for the consolidated assembly of equipment, and they erected dormitories for the people.

And in Surgut? The industrial assembly base here, it appears, will be completed after the plant goes into operation. Right now, at least, less than half of the 3.5 million rubles allocated to it have been assimilated. Thus, crash work has already been programed for this spring: the labor intensiveness of installation work under field conditions increases 3-fold to 4-fold. And that means that the next wave of business visitors will splash over USSR Minmontazhspetsstroy [Ministry of Installation and Special Construction Work] subunits. And where will you put the people?

Chief of Surgut's Zapsibneftekhimmontazh [Administration for the Installation of Petrochemical Equipment in West Siberia] V. Sidel'nikov reported that only last year the collective lost more than 100 installers--almost half of the staff. People quit because of unsatisfactory housing. That is, there is not enough housing for the permanent staff of installers, not to mention those who arrive for temporary work!

Meanwhile, soon thereafter, in September, First Deputy USSR Minister of Power and Electrification P. Palaleyev put his signature to a document, not the first at all, which said, "Provide accommodations for workers and travelers to USSR Minenergo and USSR Minmontazhspetsstroy organizations in dormitories with the amenities." But this instruction was carried out only partially. The Surgut Housing Construction Combine of Minneftegaz-stroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] is assimilating the funds, and they are sizable, that are allocated each year for constructing housing for oilfield workers, power workers and installers at a truly turtlelike pace. And Zapsibenergostroy, which in this situation is not formally responsible for the erection of housing, has, in essence, abandoned concern for the integrated conduct of the operations. For the general contractor is in no hurry to put things in order even in the settlements made up of mobile housing and temporary housing--to repair, to heat and to lay water lines--although there is no need for large funds or special forces. It is just that there is not enough concern.

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INNOVATORS AT ZMIYEVSKAYA GRES PRAISED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 3 Feb 80 p 1

[Article by O. Shkavron, senior machine operator of the electric-power station and member of the oblast committee of the Communist Party of the Ukraine (Gotval'd, Khar'kovskaya Oblast): "The Energy of Creation"]

[Text] The current election campaign is noteworthy for what is occurring on the eve of the 110th anniversary of V. I. Lenin's birth and the 35th anniversary of victory in the Great Patriotic War. Both dates are dear to the hearts of each of us, and this will stimulate shockwork to greet election day with worthy labor gifts.

Let us take a look in any department or section of our Zmiyevskaya GRES imeni G. M. Krzhizhanovskiy. Each person is filled with the desire to do more and to work better, to help the comrades to achieve a general upsurge. With such an attitude toward the job in these preelection days, people would appear to be summing up the results of what has been achieved since the start of the five-year plan, in the period between the elections.

Right now we power workers are having the so-called fall-and-winter period of maximum load--the most strenuous for an electric-power station's collective. The changing operating regimes require smartness, alertness, resourcefulness, intuition and skill in raising the condition of the machine not only by means of instruments but also by instinct. The occupation is one for both the hands and the head.

During the time between elections we have introduced 40 major engineering innovations and more than 1,000 rationalizers' and inventors' suggestions. As never before, the creative bonds of engineers with workers and of all our production workers with the power-machinery producers and scientists have been strengthened.

Among the supporters of engineering progress are engineers B. Zima, L. Myazin, A. Gurin and V. Vorobey, senior foreman A. Shevchenko, workers V. Komov and Ye. Strogiy, and many others. They are united by a passion for new technology, a striving to transform production and to make their own personal contribution to the common task.

What exactly have the innovators done? Together with scientific workers of the Kiev Polytechnical Institute, they executed a set of measures to raise the reliability of boiler heating surfaces. The number of forced shutdowns of units was sharply reduced. Together with specialists of the Khar'kov Turbine Plant, we were able to modernize one of the turbines with a capacity of 300,000 kw, which also brought great advantage. With the participation of workers of Khar'kov's Elektrotyazhmash, improvements in the design of certain components of 300,000-kw turbogenerators were introduced.

These and other innovations made it possible to raise appreciably the reliability and economy of equipment operation. Enormous economic benefit has already been obtained from one reduction. For example, what does it means to introduce a power block after a forced shutdown? It means the expenditure thereon of 200 tons of standard fuel equivalent to start it up! And so you can judge how important it is for us to modernize the equipment and to improve its engineering characteristics.

One event of these years was the introduction into operation of the first line of an automated system for controlling operating processes. The operators' work has been facilitated by the use of electronic computers. Every 15 minutes the computer supplies them with information about the power block compared to the standard indicators, it helps to maintain the rhythm according to the dispatcher's schedule, it distributes the load economically among the blocks, and it keeps an eye on the sequence of working of the operational safeguards. The ASU [automated control system] serves also to transmit data to the central control point of the production association of Khar'kovenergo [Khar'kov Power-Engineering Administration].

Finally, new few engineering improvements are associated with preservation of the environment. The innovators have helped to improve the purification installations: the discharge of gases into the atmosphere and the dumping of waste water into the Severskiy Donets have been reduced. But this is, we shall say it directly, only a start. During the next five-year period there is to be no unfavorable effect on nature at all.

What, then, is the result: what were the fruits of the labor of our collective in the 4 years? Additional generation of electricity exceeded 400 million kw-hr. About 50,000 tons of standard fuel equivalent were saved. The consumption of electricity for in-house needs was reduced by 31 million kw-hr. I will note especially that 1979 goals were met with fulfillment and overfulfillment of the plan tasks.

Having mounted a shock drive in honor of election day, the power station's collective is struggling increasingly persistently for high reliability and economy of the power blocks. In our boiler-turbine department No 2, machine operators V. Yermakov, A. Kalinin and I. Ostashevskiy are toiling excellently. We have all undertaken to save 400 tons of standard fuel equivalent by 24 February, and this is a meaningful addition to our output.

An atmosphere of friendly creative labor is being created in the station's collective by the vigorous socialist competition and persistent organizational work conducted by the party organization and by the wide participation of workers in civic life. In our department, for example, there are few who do not have a mission. Block machine operators I. Kravchenko and V. Fedorovskiy, who are deputies of the settlement's soviet, are distinguished by high initiative in executing their civic commitments. And right now we have offered our advanced workers V. Kabykin and V. Pankratov as candidates for deputies of local soviets. It is assured that they also will serve the people faithfully.

The other day the power workers of Khar'kovskaya, Poltavskaya and Sumskaya oblasts ceremonially observed the 50th anniversary of the Khar'kov power system, which was born under the Leninist GOELRO plan. We are proud that a kind word was said on the holiday about our electric-power station and its people.

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ELECTRIC POWER

UNDERGROUND PUMPED-STORAGE POWER STATION DESIGNED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Feb 80 p 4

[Article by I. Prashchitskiy, correspondent of the Ministry of Power Machine Building press center: "The GES in the Earth's Crust"]

[Text] Everything was unusual here: even this underground room of vast dimensions--it stretched out into a long tunnel almost 2 km long, as if it had been solidifed, pending the arrival of powerful generators. Not much time will pass before a booming rumble of water will break the silence of the underground vaults and its head will push turbine blades. And a river of electricity will flow through the cables overhead....

Just what is this--an electric-power station? Yes! Then why did they hide it away in the depths of the earth? The fact is that this is an unusual power station--a pumped-storage station. Here, at a depth of a kilometer, is the "heart" of the GAES [pumped-storage electric-power station]. And on top are only a lake and two small buildings. Their modest appearance is not in any way compatible with the notion of a high-powered hydraulic-engineering structure. But indeed, this is just the tip of the "iceberg."

But now I should ask the reader's pardon: we have completed only an imaginary journey into the depths of the earth. There is no such station yet. More precisely, it still exist only in a design that Gidroproyekt [All-Union Design, Survey and Scientific-Research Institute imeni S. Ya. Zhuk] specialists have developed. But why did they have to install the turbines deep in the earth and build reservoir rooms there?

The idea of pumped-storage power stations is well known: at night, when factories and people are sleeping, there is a surplus of electricity--the GES's and TETs's work almost at idling speed. But in the daytime there is not enough power. It is this uneven pulse that the GAES should smooth out. During the night its pumps raise water into the basin on top. And during the daytime this water, falling from a height, forces the turbines of electric generators to turn.

In order that the GAES may work effectively, there must be a great drop of the water--100 meters at least. This prerequisite is easy to carry out in a mountainous locality, but nature, alas, does not always by far grant such opportunities: most industrial facilities and cities are located in the lowlands. What should be done?

In the search for a way out an idea was born--put the lower basin underground. At what depth? This depends upon the size. The greater the depth, the smaller the underground reservoir need be.

Of course, the erection of such GAES's is not a simple matter. The engineers have to solve complicated engineering problems. For example, turbines that can withstand the enormous head of water will have to be created, and the requirements for materials and electrical equipment will rise. But the preliminary calculations of specialists of the Leningrad Metal Plant Production Association will allow us to hope for the success that we all need. The main virtue of shaft-type GAES's is their sparing effect on the environment. They do not withdraw large spaces of grain fields, gardens or forests from use. They can be built in practically any region. They can even be concealed in the earth's depths, and they will operate underground invisibly for mankind.

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ELECTRIC POWER

OIL-SHALE MINERS, SHALE-FIRED POWER PLANT PLEDGE HIGH OUTPUT

Moscow IZVESTIYA in Russian 15 Feb 80 p 1

[Article by T. Gerasimova (Estonian SSR): "The Power-Engineering Workers' Greeting"]

> [Excerpt] Comrade L. I. Brezhnev's greeting to the workers of the republic's fuel and power enterprises stimulated great inspiration among power workers. The cities of Narva and Kokhtla-Yarve were decorated with network banners and slogans. In the hall of the Energetik Palace of Culture are booths that tell about the glorious victory of the shale miners and of the power-station collectives.

Narva and Kokhtla-Yarve are fraternal cities. Kokhtla-Yarve is the capital of the Estonian shale basin, and the raw material for power engineering is being mined here at underground and strip mines. At Narva are the largest electric-power stations to operate on shale--the Pribaltiyskaya and the Estonskaya GRES's. Their total capacity exceeds 3 million kw, and the electricity generated here is the cheapest in the country's northwest. This high-capacity fuel and power complex as a whole is in the country's Unified Power System. And it operates reliably, economically and stably.

And here are the results. Since the start of the five-year plan, 8.7 million tons of shale fuel have been mined above the plan, enabling stable operation of the power stations. A high level of labor productivity--an estimated 200 tons per miner for underground operations and an estimated 572 tons per miner for strip operations--are being achieved here.

In response to Comrade L. I. Brezhnev's greeting, it was resolved to mine 300,000 tons of shale above plan by the 110th anniversary of V. I. Lenin's birth and to complete the five-year plan by Miners' Day--31 August. Each brigade of breakage-face workers will provide for the mining of at least 500,000 tons of rock during the year.

The power workers also adopted a greeting. At the Estonskaya GRES, the first specially built industrial-test installation for power-engineering

technology for obtaining liquid fuel (furnace oil) from shale has just been introduced into operation. Work on a second installation is in the concluding stage.

The goal assigned to the republic in "The Main Directions for Developing the USSR's Economy During 1976-1980" has been met. Fuel and power enterprise workers will complete the plan for the generation of electricity for the five-year period by USSR Constitution Day and will save 10,000 tons of standard fuel equivalent above the plan.

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ELECTRIC POWER

CHANGEOVER OF THE 220 KV ROVNO-GRABOV LINE TO 330 KV

Moscow ENERGETIK in Russian No 2, Feb 80 pp 23-24

[Article by M. Ya. Borovik, engineer of the L'vov Power System]

[Text] In order to take care of the growth of electrical loads and lower the losses in electric energy, new electric power transmission lines and substations are built and the existing electric power facilities are changed to higher voltages. The practicality of the changeover to higher voltages is determined in each concrete case after a detailed study and the necessary technical and economic substantiations.

In the L'vov power system, the Rovno-Grabov 220kV high-voltage line of 10 km was changed to 330 kV in 1973. In 1959, the 220kV high-voltage line was put into operation being designed in accordance to the II regior of climatic conditions with respect to ice deposits on wires and a wind velocity of 25 m/s. Twenty-five metal supports were installed along the line: intermediate supports of the PSh and PSh-1 ("Ryumka")-type and anchor towers of the UT-type. The foundations of the supports were of reinforced concrete and pile-supported. Their effective span was 450 m. The AS-400 wire with a maximum stress of 10.5 kg-force/mm^2 was used on the line.

Wires in the supporting chains on the PSh-1 supports were secured in dead-end clamps, while on the PSh supports, the middle phase was secured in dead-end clamps and the end phases were secured in free-center-type clamps. The high-voltage line had two S-70 lightning protective cables. Insulator chains had P-4.5-type insulators.

The plan for changing the high-voltage line to 330 kV contained the following variants:

construction of a new high-voltage line of 330 kV on reinforced-concrete supports with two ASO-300 wires in each phase;

increasing the insulation of the existing 220 kV high-voltage line to 330 kV. This variant was rejected, because, according to the corona conditions, the intensity of the electric field of one AS-400 wire is 30 kV/cm, which is inadmissible according to the conditions of the level of radio interference;

replacement of the existing AS-400 wire with two ASO-300 wires. This required reevaluation of the mechanical strength of the supports and foundations. Calculations showed that the anchor towers and corner poles would withstand the mechanical load, and the intermediate supports PSh and PSh-1 would meet the strength requirements for suspending two ASO-300 wires in a phase only if the wind span is shortened to 230 m. It was decided to install an additional reinforced-concrete support of the PB-330-1-type in each span;

to connect on the high-voltage line two new ASO-300 wires or to use the existing AS-400 wire and add an ASO-300 wire in each phase.

Experience has confirmed that heavy wires (AS-400) get damaged during their dismantling, therefore it is not practical to reuse these wires in construction. In this connection it was proposed to retain the existing AS-400 wire and to suspend an ASO-300 wire as the second wire. The AS-400 wire has already passed the period of stretching during the time of operation (14 years), therefore, in order to prevent possible misalignment of the wires in the phase (old AS-400 and new ASO-300), L'vov OKPEnergoset'proyekt [Planning, Surveying and Scientific Research Institute of Power Systems and Electric Power Networks] proposed a method of forced prestretching of the ASO-300 wire. On the basis of the maximum permissible stress on the existing supports, the stress for the AS-400 wires was six kilogram-force/mm^2, and for the ASO-300 wires -- 6.7 kilogram-force/mm^2.

On the basis of these data, calculations were made for the sag in each span and the value of possible misalignment of wires, which was found to be up to 10 cm. Considering that the arrangement of the wires in a phase was taken to be vertical, such misalignment is permissible.

Economic calculations confirmed the practicality of changing the high-voltage line to 330 kV with retention of the existing ASO-400 wire, suspension of the second wire ASO-300 in the phase, and installation of additional reinforced-concrete supports of the PB-330-1-type in each span.

The number of insulators is selected on the basis of the Instructions for the Selection and Use of Insulators in Regions with a Polluted Atmosphere. The supporting chains have PSG-6A insulators and consist of 25 elements, and strain chains have PS-12A insulators and consist of 28 elements.

In order to prevent the wires of the middle phase from approaching impermissibly close to the body of the supports of the PSh and PSH-1 types, the wire is suspended by means of U-shaped chains. This made it possible to fix the position of the wire of the middle phase and preserve a constant insulation distance between the wire and the body of the support.

At the same time, it was found that the permissible air distance from the current-conducting parts of the middle phase to the body of the support in the case of atmospheric overvoltage was 10 cm shorter than that required

according to the standards. This deviation was accepted upon agreement with the Main Technical Administration for the Operation of Power Systems of the USSR Ministry of Power and Electrification. Due to the reduction of the permissible air distance, it was possible to expect an increase in the line cutoff cases due to thunderstorm overvoltage.

In order to make a quantitative evaluation of the probable number of line failures under these conditions, computations were made in accordance with the Instructions for the Protection of Alternating-Current Electrical Engineering Installations Against Overvoltage. These calculations showed that, when the air distance is shortened by 10 cm, the specific number of cutoff cases due to thunderstorms (for 100 km of the line and 100 thunderstorm hours) will increase by 0.21. For the line in question, this increase in absolute figures constitutes 0.12 a year, which is permissible.

Lightning protection of the high-voltage line is accomplished by two S-70 cables suspended along the entire length of the line. The cable is secured on the supports with the aid of PSG-6A insulators. The cable is grounded at the approaches to the substations. The wires and cables are protected against vibration by vibration dampers.

During the five years of operation of the high-voltage line at 330 kV, there was only one instance of automatic cutoff by the relay protection system with a successful reclosure, which indicates its stable and reliable operation.

It should be mentioned that the changeover of high-voltage lines to a higher voltage requires a large input of physical labor due to the necessity of strengthening the supports and replacement of individual parts at various heights. Moreover, during the time when the line is cut off for the purpose of reconstruction, the circuit worsens and consequently the reliability of electric power supply to the consumers also worsens.

Conclusion

The changeover of the existing high-voltage lines to a higher voltage should be done in cases of extreme necessity and must be necessarily substantiated economically, otherwise new lines should be built.

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BRIEFS

NUREK POWER LINE COMPLETION--On the eve of the new year, construction of the high-voltage power transmission line that joins the Nurekskaya GES with the Unified Power System of Central Asia was completed. The "river" of electricity, more than 700 km long, stretches from the valley of the Vakhsh across the Pamir Mountains and the Gissar Range and the Karshi and Golodnyy steppes to the standard bearer of Uzbekistan's power-engineering system--the Syrdar'inskaya GRES. Mobile columns of Sredazelektroset'stroy [Trust for the Construction of the Central Asian Electric-Power Grid] laid the concluding link of this route--the 342 km from Guzar to Shirin--in practically one year. The brigades of Anvar Bakhtiyev, Yuriy Tsunov and others distinguished themselves here. With the arrival of the inexpensive power of the Nurekskaya GES over the LEP-500 [500-volt electric-power transmission line] to customers in Uzbekistan, Kirgiziya and Kazakhstan, the national economy will be able to save more than 1.1 million tons of standard fuel equivalent in a year. But the reserves of this line will enable the power throughput to be doubled later, taking into account the construction of the Rogunskaya and other stations of the Vakhsh cascade. During the fourth year of the five-year plan the collective of Sredazelektroset'stroy erected still another series of important facilities on Uzbekistan's soil. Thus a high-voltage line 40 km long to a pump station on the Syr-Dar'ya, the Yuzhnaya substation at Tashkent and the Almalykskaya substation were erected. Construction and installing work volume increased by 5.7 million rubles' worth over the preceding year. [Text] [Tashkent PRAVDA VOSTOKA in Russian 1 Jan 80 p 1] 11409

IRTYSH DAM START--The excavation of soil from the foundation pit of the future building of the Shul'binskaya GES has started on the left bank of the Irtysh (Semipalatinskaya Oblast). Six hydroelectric-power units with a total capacity of 1.35 million kw will be installed in the machine room. [Text] [Moscow PRAVDA in Russian 6 Feb 80 p 2] 11409

SULFIDE-YEAST CONCRETE ADDITIVE--An installation unforeseen by the design has appeared at the concrete plant of the Shamkhorskaya GES. Uncomplicated in design, it has enabled concrete quality to be greatly improved. The installation adds a sulfide-yeast mix to the concrete. This inexpensive waste of the pulp and paper industry possesses remarkable characteristics. Thanks to its additives, the concrete thickens more slowly; this enables

it to be transported over substantial distances. The impermeability to water and resistance to freezing of the building material are increased. The deformation that is inevitable during subsidence of the concrete is reduced by 15 percent, preventing cracks in the concrete and raising its longevity. The builders of the Shamkhorskaya GES, who used concrete with yeast additive during erection of the spillway and while laying the footings for the GES's buildings, are convinced of all this. Yeast additives for concrete were known previously. But Shamkhor builders, on the recommendation of the NII [Scientific-Research Institute for Concretes and Reinforced Concretes] of USSR Gosstroy have used them for the first time in dosages that are more than double or triple the ordinary dosages. And the results have exceeded expectations. Almost 50 kg of cement have been saved for each cubic meter of the work, and the quality of the concrete structures has been raised. (TASS) [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 23 Jan 80 p 2] 11409

KIRGIZIYA POWER LINE--Pokrovka, Kirgiz SSR. Having hooked up the remote livestock-raising complexes of the Pobeda Kolkhoz to the state power system, the installers recently completed the conversion of all the farms of the high-mountain Dzhety-Oguzskiy Rayon--the largest sheepraising area of the Issyk-Kul' region--to a centralized power supply. Full electrification of livestock-raising facilities became possible with creation of the Issyk-Kul' power ring that encircles the lake's basin. With startup of the first three stations of the Naryn cascade--the At-Bashinskaya, the Uch-Kurganskaya and the Toktogul'skaya GES's--the annual consumption of electricity by Kirgiziya agriculture has reached 1.2 billion kw-hr. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Feb 80 p 2] 11409

ZAINSKAYA POWER STATION PERFORMANCE--Kazan'. One hundred eighty billion kw-hr--this is the figure that the meters of the Zainskaya GRES registered at the start of the concluding year of the five-year plan. This is how much electricity was generated by the station--the firstling of large-scale power engineering of Tataria since the startup of the first power block. This goal was reached 3 months ahead of time. Zainskaya's power workers, implementing 25th CPSU Congress decisions, set as one of their main tasks the saving of fuel resources. This year, for example, the specific fuel consumption at the station was reduced by 0.8 gram. This is the result of good repair, the introduction of improved technology and new equipment, and the active work of rationalizers. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Feb 80 p 1] 11409

KOLYMA POWER TRANSFORMER SHIPPED--The first 186-ton transformer for the Kolymskaya GES, which is under construction, was shipped to the Magadan seaport. The supplying enterprises and the transportation workers who concluded agreements with the hydraulic power system builders in competition under the Workers' Relay Race principle are striving to support startup of the station's first unit this year. The transformer, which was made ahead of schedule at Zaporozh'ye, was sent to Vanino port on a special flatcar and from there it came to Magadan on the maritime ferry "Sakhalin-6," across the Japan and Okhotsk seas. Here it will be reloaded

onto a special automotive trailer and sent to Sinegor'ye. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 7, Feb 80 p 3] 11409

BELOYARSKAYA FAST-BREEDER REACTOR--The first power block with fast-breeder reactor, with a capacity of 600,000 kw, has been readied for startup at the Beloyarskaya Nuclear Power Station. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 7, Feb 80 p 3] 11409

'ATOMMASH' VESSEL WELDING--Atommash welders, in hooking up complex equipment for operation, have in the past been welding together the attendant parts of the first set of nuclear power engineering equipment. Right now they have taken the first step in the main area: they have begun to weld the shell of the reactor itself. The work includes the vessel's connector zone. No little time is required to weld a part more than 30 cm thick, together with welding of the connections: almost a month. In their socialist commitments, which were published in issue No 5 (37) of the newspaper SOTSIALISTICHESKAYA INDUSTRIYA, at Atommash the collective of the Atommash production association decided to complete during 1980 the refinement of the main industrial processes for vessel articles for nuclear power stations. This will enable the vessel of the first Donsk nuclear reactor to be manufactured half a year ahead of time. [Excerpts] [Moscow SOTSIALISTICHESKAYA NDUSTRIYA in Russian 31 Jan 80 p 4] 11409

DNEPROGES-2 GENERATORS--Khar'kov. Workers of the Elektrotyazhmash plant have completed fabrication of the eighth and last generator for Dneproges-2. The new machine, with a capacity of 105,000 kw is much more reliable and economical than previously produced units. Service life between overhauls has been extended from 3 to 5 years. The order was carried out a month early. This will help the hydraulic-system builders to carry out their commitment successfully--to turn over for operation all units of the station's new line by the 110th anniversary of the birth of V. I. Lenin. Then the GES's capacity will be almost 1½ million kw. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 27 Feb 80 p 1] 11409

KIRGIZ HYDROPOWER CONSTRUCTION--Kara-Kul', Kirgiz SSR. The collective of KurpsayGESstroy [Trust for Construction of the Kurpsayskaya GES] has undertaken a socialist commitment to complete erection of the GES ahead of time and to start up the first unit now, about a year ahead of the plan deadline. Right now construction is going on ahead of schedule, and there is every basis for hoping for success. It is true that from time to time the cement suppliers--the Kuvasay Cement Plant--lets us down. And here again we cannot get along without the active intervention of Deputy Sabirov. [Excerpts] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Feb 80 p 2] 11409

NUCLEAR POWER-PLANT ROBOT--Kurchatov, Kurskaya Oblast. A robot has been installed at the second block of the Kurskaya AES, which will load multimeter heat-generating cassettes into the reactor and remove them therefrom. Formerly this was done at AES's by special cranes. But in order to undertake this recharging operation, it was necessary to switch off the reactor and to stop the turbines, so several tens of days were spent on

this each year. Use of the RZM [robot charging machine], which has been called another "atomic robot," will permit not an instant of generation of current to be lost. And two robots will enable the power-engineers to produce annually 2.6 billion kw-hr of electricity more than before the RZM's appearance. Such machines will be installed at subsequent blocks of the station that are still under construction. [Text] [Moscow NEDEL'YA in Russian No 6, 4-10 Feb 80 p 4] 11409

KHABAROVSK HIGH-VOLTAGE LINE. Birobidzhan. The first 100 km of a high-voltage line has crossed the Malyy Khingan Range between the cement workers' settlement of Teploozersk and the railroaders' city of Obluch'ye in the northwest of Khabarovskiy Kray. In May 1980 the LEP-220 [220-volt electric-power transmission line], more than 200 km long, will join the Zeyskaya GES power system in Amurskaya Oblast with Khabarovskiy Kray consumers. In particular, the energy of the firstling of Far Eastern hydroelectric power workers will feed the electric-locomotive traction net. The collective of Mechanized Column No 110 of Dal'elektrosetstroy [Trust for the Construction of Electric-Power Grids in the Far East] is building the new line. Having begun a shockwork drive in honor of the 110th anniversary of V. I. Lenin's birth, the LEP builders have been overfulfilling the schedule for the erection of supports and the installation of wire. [Text] [Moscow SOVETSKAYA ROSSIYA in Russian 9 Dec 79 p 2] 11409

SURGUT POWER-STATION AUTOMATION--Surgut. The startup and setting up work on the installation of an automated system for controlling the Surgutskaya GRES has been completed. With its introduction into operation, the work of the operators of the station's power blocks will be facilitated. The computers will begin to supply all the necessary information on the screens of several television sets, which replace the unwieldy panels with an enormous number of instruments at the control position. The ASU [automated control system] will not only provide specialists with operating information but will also exert direct control over the power blocks. Reliability in the stable supplying of electricity to the oil and gas fields of Tyumenskaya Oblast will rise. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 Jan 80 p 2] 11409

GENERATOR FOR UKRAINIAN POWER--Khar'kov. The manufacture of a generator for Dneproges-2 was completed yesterday at the Elektrotyazhmash plant. Possessing all the virtues of its serially produced predecessors, which were certified to be of the highest quality category and are operating trouble-free at a well-known electric-power station, this 105,000-kw capacity unit also has some advantages. By improving some components, its reliability has been raised and its heat losses reduced, and time between overhauls has been extended from 3 years to 5. (TASS) [Text] [Moscow SOTSIALISTICHESKAYA GAZETA in Russian 24 Jan 80 p 1] 11409

NEW YENISEY POWER PLANT--Sayanogorsk, Krasnoyarskiy Kray. The pumping of water from the left-bank excavation pit for construction of the Maynskaya GES--the third on the Yenisey--has been completed. The excavation of rocky soil for the dam's foundation has begun. The hydraulic works builders have committed themselves to laying the first cubic meter of concrete by the 110th anniversary of the birth of V. I. Lenin. The site selected for the new station is 30 km on the Yenisey from the Sayano-Shusenskaya GES. According to the specialists' calculations, fluctuations in the tailrace of this giant will reach 6 meters; this would threaten the shores and the normal water supply of the cities and settlements along the shores with destruction. The reservoir of the Maynskaya GES will "extinguish" such fluctuations of water and provide for uniformity of the Yenisey's flow. The Maynskaya GES's electric-power capacity will be 320,000 kw. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 Jan 80 p 2] 11409

KIRGIZ HIGH-VOLTAGE LINE--Frunze. The Toktogul'skaya GES, the largest in Kirgizia, has helped to satisfy the requirements of enterprises for electricity more completely. It completed generation of 1 billion kw-hr on the fifth day after startup. One of the items of the commitments in honor of the 110th anniversary of the V. I. Lenin's birth has been carried out ahead of time. "Having reached design capacity, the Toktogul'skaya GES has become the power heart of our republic's industrial and agricultural enterprises," says chief of Kirgizglavenergo [Main Administration for Kirgiz SSR Power Systems] M. Azrilyan. "Thus, with the introduction into operation of the high-mountain Toktogul'skaya GES-Frunze LEP-500 [500-volt electric-power transmission line], the delivery of current to the northern regions of Kirgizia and South Kazakhstan has greatly increased. The 'Toktogulka' is supplying industry and agriculture of Uzbekistan, Tadzhikistan and Turkmenia through another high-voltage arterial. The thermal power stations of these republics have saved more than 2 million tons of fuel by the arrival of the mountain GES's cheap energy." The hydroelectric power station on the Naryn is also successfully carrying out its irrigation role. Right now the bowl of its reservoir has accumulated 11 billion cubic meters of moisture. Such a reserve is adequate for irrigating hundreds of thousands of hectares of fields. [Text] [Moscow SEL'SKOYE KHOZYAYSTVO in Russian 7 Feb 80 p 1] 11409

RIGA TURBOGENERATOR TESTED--The people not only of Riga but also of the whole republic have been waiting impatiently for this event at Rizhskaya TETs-2. And now on the eve of Power Workers' Day, an integrated check of the last and fourth turbine generator has been completed. It was put under load 2 years ahead of the originally planned deadline. With it's startup, the heat and electric-power central has achieved a capacity of 390,000 kw and become the second in size in the republic, following the Plyavin'skaya GES, as a supplier of electricity. [Excerpt] [Riga SOVETSKAYA LATVIYA in Russian 22 Dec 79 p 2] 11409

SAYANO-SHUSHENSKAYA GES CONSTRUCTION--Sayanogorsk (Krasnoyarskiy Kray). The four-millionth cubic meter of concrete has been laid in the body of the Sayano-Shushenskaya GES's dam. The new electric-power giant on the

Yenisey is not only being built but it is also generating output. With startup of the third unit, the hydroelectric-power station is able to generate tens of millions of kilowatt-hours of electricity each day. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 18 Jan 80 p 1] 11409

NEW LATVIAN POWER STATION--Riga. Expansion of the Kegumskaya hydroelectric-power station on the Daugava has been completed. Its capacity has been tripled. Three hydroelectric-power stations are now operating on the lower course of the Daugava--the Kegumskaya, Rizhskaya and Plyavin'skaya. An increase in their capacity is of importance for the normal operation of the whole power system of the country's northwest. These stations have been intended primarily to cover "peak loads" during the hours of greatest consumption of electricity. This is why work on the use of the Daugava River's power resources continue. The erection of a new large hydraulic engineering complex in the east of Latvia--the Daugavpilsskaya GES--commenced recently. Construction work is proceeding with precision, according to the schedule. In 1980 its volume will double. [Text] [Moscow IZVESTIYA in Russian 1 Jan 80 p 2] 11409

NEW IRIKLINSKAYA POWER UNIT--Orenburgskaya Oblast. Iriklinskaya, the largest GRES in the south Urals, has begun the concluding year of the Tenth Five-Year Plan by reaching its designed capacity--2.4 million kw. One more panel has been lit up with gay little beads at the central control panel. The work of the on-duty personnel has become more strenuous, since 300,000 more kilowatts have been added to their job. As before, the eighth power block was put into operation ahead of the deadline. For the GRES as a whole, the introduction of power blocks ahead of schedule has enabled more than 250 million kw-hr of additional electricity to be generated. Now the GRES will become one of the country's largest thermal electric-power stations. Half of the units of the Iriklinskaya station operate on liquid fuel, while half are using gas that comes to the Urals from Bukhara. The startup of the eighth power block ahead of schedule is a convincing victory for the builders and operating personnel. They have developed a precise system of interaction that provides for unfailing observance of the schedules for installing steam generators and other equipment. Such an important indicator as specific consumption of standard fuel equivalent per kw-hr is 319 grams here. [Excerpts] [Moscow IZVESTIYA in Russian 3 Jan 80 p 1] 11409

POWER FOR NORTH CASPIAN--Gur'yev. Electricity has come to Taysoygan, a broad sandy tract of the northern Caspian. Yesterday a 100-km LEP [elec-power transmission line] went into operation here, yielding current for livestock complexes of the remote Sovkhoz imeni Engel's and other facilities of the large sheep-raising area. [Text] [Moscow TRUD in Russian 19 Jan 80 p 1] 11409

NEW SURGUT POWER UNIT--Surgut. The 11th power block of the Surgutskaya GRES--the country's highest-powered electric-power station to operate on casing-head gas--was put under an industrial load yesterday. Its electricity was sent to oilfields, construction projects and cities and settlements of West Siberia. (TASS) [Text] [Moscow TRUD in Russian 19 Jan 80 p 1] 11409

ISSYK-KUL'SKAYA OBLAST POWER--Production sections of the Pobeda Kolkhoz have been hooked up to the State Power System. Conversion to the centralized power supply of all farms of the high-mountain Dzhety-Oguzskiy rayon--the largest sheep-raising area of Issyk-Kul'skaya Oblast--was thereby completed. (TASS) [Text] [Moscow IZVESTIYA in Russian 1 Feb 80 p 2] 11409

NEW NUCLEAR-POWER PLANT--The Zaporozhskaya GRES and the new city of Energodar were born several years ago at the celebrated Kamenskiye Kuchugury. Now the foundation has been laid for a new electric-power station--a nuclear one. The right to lay the first concrete was given to V. Menzhinskiy's integrated brigade. The nuclear-power station will surpass the GRES in capacity. It will generate its first current during the next five-year plan. [Text] [Moscow IZVESTIYA in Russian 6 Feb 80 p 1] 1140

CSO: 1822

BETTER REPORTING OF FUEL, ENERGY CONSERVATION URGED

Moscow VESTNIK STATISTIKI in Russian No 2, Feb 80 pp 40-48

[Article by S. Litvak and A. Sal'nikov: "On Changes in the Reporting of Fulfilling the Consumption Rates for Fuel and Energy Resources and an Analysis of Data on Their Use in Production"]

[Text] Under the conditions of the ever widening struggle in the nation to improve the efficiency of social production and the quality of work, the questions of the rational utilization and saving of material resources are assuming particular urgency.

In the Decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1979 "On Improving Planning and Strengthening the Effect of the Economic Mechanism on Raising Production Efficiency and Work Quality," the program for saving fuel was termed the first among the primary comprehensive programs to be worked out for the 11th Five-Year Plan to solve the most important scientific-technical, economic and social problems for the nation.

To a significant degree the work in the area of improving rate setting and accounting for the consumption of fuel, thermal and electric power, as well as reporting on the fulfillment of the consumption rates of fuel and energy resources and the quotas for reducing them helps to successfully carry out the program to save fuel and energy. The latter is achieved by raising the scientific soundness of the consumption rates to be set, by a maximum increase in the share of normed consumption, by organizing an improved system of accounting, reporting and control over the consumption of fuel and energy, by systematically analyzing data on their use and by involving the discovered reserves for saving fuel and energy resources in production.

At present there are the following types of reports: the mail annual report "On Fulfilling the Standards and Quotas for the Average Reduction in the Consumption Rates of Fuel, Thermal Power and Electric Power" using Form No 11-sn with Appendix No 1 "Actual Consumption of Boiler and Furnace Fuel for the Production of Individual Types of Product and Work" and Appendix No 2 "The Formation and Use of Fuels and Thermal Secondary Energy Resources," as well as the mail quarterly report "On Fulfilling the Rates

and the Consumption of Fuel, Thermal Power and Electric Power" using Form No 11-sn (Short).

In contrast to the quarterly report, the annual one is drawn up for a broader range of indicators. The quarterly report gives a description of the fulfillment of the consumption rates for fuel and energy as set for the report period. The annual report, in addition to this, also gives a description of the fulfillment of the set quota for the average reduction in the consumption rate of boiler and furnace fuel, thermal power and electric energy, that is, the reduction (or rise) in actual consumption over the report year in comparison with the consumption calculated according to the rates of the previous year.

The annual report according to Form No 11-sn with Appendix No 1 to this form and the quarterly report according to Form No 11-sn (Short) are submitted by the following: a) by all industrial, construction, transport, municipal utility and other enterprises and organizations operating on an independent balance sheet and consuming fuel and energy with an average daily consumption (over the year) in conditional fuel units from 2 tons and more or thermal power of 15 gigacalories and more, or with connected (installed) electric capacity of 100 kilovolt·amp (kilowatts) and more; b) by all power plants, industrial-production and regional boiler plants, as well as by the enterprises of the united boiler and thermal networks.

Appendix No 2 to Form No 11-sn is submitted by all industrial enterprises operating on an independent balance sheet and under the following ministries: the USSR Ministry of Ferrous Metallurgy, the USSR Ministry of Gas Industry, the USSR Ministry of Lumber and Woodworking Industry, the USSR Ministry of Nonferrous Metallurgy, the USSR Ministry of Building Materials Industry, the Ministry of Pulp and Paper Industry, the Ministry of Heavy and Transport Machine Building, the Ministry of Power Machine Building, the Ministry of Chemical and Petroleum Machine Building and the Ministry of Chemical Industry.

The information received as a result of the elaboration of the above-indicated reporting makes it possible to monitor the course of fulfilling the set quotas for reducing the consumption rates of fuel and energy, and serves as the basis for analyzing data on fuel and energy utilization and disclosing reserves for further improving the efficiency of social production. The report data on the fulfillment of the consumption rates of fuel and energy are also considered in drawing up the consumption rates and balances of the fuel and energy resources for the levels of national economic planning and management, as well as in encouraging the workers to save fuel and energy.

The reports using Forms No 11-sn and No 11-sn (Short) are drawn up on the basis of data from the primary production documents and the varified accountancy data for the consumption of fuel and energy directly at their consumption points. The accounting for the consumption of fuel and energy at the enterprises is carried out in shift, daily and monthly breakdowns. The first is caused by

the necessity of determining the results of the work of each shift; the second by the demands of operational daily control over the observance of the rules regulating the procedure of the production process and energy consumption in the shops and at the units in accord with the approved fuel and energy consumption rates; the third by the necessity of compiling the quarterly and annual reports on the fulfillment of the consumption rates for fuel, thermal and electric energy, and the quotas for reducing them, the analysis of data on the fuel and energy use in production, as well as by the needs of economic accountability.

One of the basic requirements which must be carried out without fail in compiling the report "On Fulfillment of the Rates and Quotas for the Average Reduction of the Consumption Rates of Fuel, Thermal Energy and Electric Energy" by Form No 11-sn is that the data for the report period be comparable with the corresponding data calculated in the planning for the same period. Thus, the data of the annual report should be compatible with the data of the "Statement for Calculating the Demand and Average Weighted Group Consumption and Savings Standards for Material Resources in Production for Planned Year" (Form No 13900) and with the corresponding planning and actual data in the preceding years.

If any changes have been made in the calculation methodology of one or another indicator (for example, the product volume) in compiling the plan for the report year or a different range of shops or enterprises has been used (because of an organizational reform of the enterprises or organizations such as a merger, division), then the report data for the corresponding indicators of the previous year should be recalculated according to the methodology and for the range of economic units used in the plan for the report year.

This requirement must also be observed because the "Basic Provisions on Setting Consumption Rates for Fuel, Thermal and Electric Energy in the National Economy" as approved by the USSR Gosplan on 17 December 1979 have provided for a statistical-calculation method as one of the methods for determining the consumption standards. According to this method, the consumption rate is to be determined on the basis of data for the actual proportional expenditures in previous years, with their obligatory analysis. Thus, the correctly formulated report data are an organic part in the process of working out the consumption rates.

A further improvement in the system of technical and economic indicators for the USSR State Economic and Social Development Plan and the rapid introduction of the achievements of scientific and technical progress in the national economic sectors necessitate an improvement in the annual and current reporting on the fulfillment of the rates and quotas for the average reduction in the consumption rates of fuel, thermal and electric power.

The statistical reporting on the fulfillment of the standards and quotas for the average reduction in the consumption rates of fuel and power should contain indicators which describe the fulfillment of the quotas as set in

the USSR State Plan of Economic and Social Development. In statistics the same system of indicators is employed as in planning, and for this reason each of the indicators should have a uniform content both in the plan and in the reporting. This will provide compatibility of the planning and corresponding report data.

However, the procedural and organizational "improvement" of the calculated and directive indicators for national economic planning has led to a situation where the report "On the Fulfillment of the Standards and Quotas for the Average Reduction in the Consumption Rates of Fuel, Thermal Energy and Electric Energy" as approved in 1974 for Form No 11-sn has not provided an answer to the basic question of how the general plan indicator is fulfilled, that is, the quota for the average reduction in the consumption rates of boiler and furnace fuel, thermal energy and electric energy in production.

In the report according to Form No 11-sn, in the first place, the fulfillment of the quotas is determined solely for the line "Total Normed Production Consumption," while at the same time the plan quota (for example, for thermal energy and electric energy) is set from the demand indicator which includes all production consumption of these types of resources, including unnormed production consumption.

In the second place, the presence in the report of the line "Unnormed Production Consumption" has created the prerequisites for distorting the data given in it on the fulfillment of the plan indicators for the use of the types of fuel and energy resources in production, since an opportunity has appeared for showing in this line the "above-planned" consumption of fuel or energy for producing individual types of products and jobs for which rates have been set (but an overexpenditure was actually permitted). In addition, the presence in the report of the line (indicator) "Unnormed Production Consumption" has not encouraged the enterprises to expand the normed production consumption of fuel, thermal and electric energy. (This can explain the fact that up to now at many enterprises consumption rates have not been worked out for resources in producing many types of products and jobs. This situation has contributed to their uncontrolled expenditure on projects where there is no consumption rate, and consequently, for the enterprise as a whole.)

Thirdly, the indicators of the first section "Fuel" in the report according to Form No 11-sn would not be compatible with the corresponding indicators of the plan for the report year, since in the report fuel consumption (boiler-furnace and motor) for the production of types of products and jobs is shown as a whole, while the consumption rates for boiler-furnace fuel and oil products are set separately. Here the quota for the average reduction in the consumption rates of boiler-furnace fuel in the plan is not extended to the oil products used in internal combustion engines.

For compiling the annual and quarterly reports on the fulfillment of the standards and quotas for reducing the consumption rates of fuel and energy,

the range of product types and jobs for calculating the demand for these resources and the average reduction of their consumption rates is worked out, as a rule, in accord with the procedure for the consumption of fuel and energy in production. This range does not remain constant. As the social division of labor develops and scientific and technical progress accelerates in the national economy, along with a change in the production structure, there is a natural process of the division as well as separation of new sectors and types of production. Here the production of new, progressive types of products (jobs) begins, and the production of obsolete ones is stopped. In line with this, the range of product types and jobs for calculating the planned demand for fuel and energy should be periodically adjusted by incorporating the new types of products (jobs) in it and excluding the obsolete ones. Such a change in the range of product types and jobs leads to a disruption in the congruity between the range used in working out the plan and the range submitted in the reporting. Consequently, as is necessary, one must adjust the range contained in the annual and quarterly reports.

The lack of compatibility in the planning and report indicators for the use of fuel and energy resources is a consequence chiefly of the insufficient coordinating of the reports according to Forms No 11-sn and No 11-sn (Short) with the "Statement for the Calculating of the Demand and Average Weighted Group Rates for the Consumption and Saving of Material Resources in Production for the Planned Year" according to Form No 13900, on the basis of which the consumption rates for fuel and energy resources in production and the planned amount of their average reduction (in the stage of drawing up the plan) are set.

For eliminating the shortcomings, the USSR TsSU [Central Statistical Administration] with the agreement of the USSR Gosplan, in 1977-1978 revised the designated reports by improving the indicators of the reporting forms and reworking the instructions on the procedure for drawing up the report in accord with the newly approved form and the present-day achievements in the area of the savings, accounting and rate-setting for the consumption of fuel, thermal and electric power in production, as well as the working out of a new enlarged range of product and job types to be accounted for and corresponding to the range contained in the USSR State Plan of Economic and Social Development and used in calculating the plan indicators for the consumption of fuel and energy.

The following changes have been made in the reports according to Forms No 11-sn and No 11-sn (Short):

a) The lines "Total Normed Production Consumption" and "Unnormed Production Consumption" have been excluded from all sections of the reports, and the line "Total Production Consumption" has been included;

b) In the first section "Fuel" two independent subsections have been established "Boiler and Furnace Fuel" and "Oil Products Used in Internal Combustion Engines (Except Motor Transport)"; for each of these subsections,

the indicators of fuel utilization are shown separately, and this corresponds to the current system of their planning;

c) The line "Other Production Consumption" has been incorporated in the subsection "Boiler and Furnace Fuel" and the sections "Thermal Power" and "Electric Power" of the summary reports for the USSR ministries and departments, while the subsection "Boiler-Furnace Fuel" (after the recalculation of the types of products and jobs), in addition includes the line "Total for the Range of Standards Accounted for by the USSR Gosplan in the Demand Calculations";

d) For establishing a uniform range of product and job types used in the calculations for the average reduction of the consumption rates of boiler-furnace fuel, thermal and electric energy according to the statement (Form No 13900) and contained in the reports according to the Forms No 11-sn and No 11-sn (Short), the range of product and job types approved in 1977, in addition to the 1974 range, includes over 140 product and job types for boiler and furnace fuel, the production of which consumes more than 80 million tons of fuel units (according to the 1978 level).

The range of product and job types represented in the section "Fuel," starting with the 1978 report, is divided into two independent ranges according to which, respectively, expenditures are shown for boiler and furnace fuel and (separately) oil products used in internal combustion engines (except motor transport). The data on the use of oil products for the operation of motor transort are shown in the report "On the Work of Truck Motor Transport and the Costs of Freight Motor Shipments" according to Form No 2-tr.

The range of product and job types has also been widened in the sections "Thermal Power" (55 additional items have been included) and "Electric Power" (over 60 additional items included).

For various reasons, about 30 items have not been transferred to the newly established range of product and job types. Certain items have been left in it as part of more general items. For example, gross coke (6 percent moisture content) has been included in the item "Coke Byproduct Production," chemical fibers are part of the item "Chemical Fibers and Filaments, Total," conversion and electrolytic ammonia are shown in the general item "Synthetic Ammonia, Total," with the isolating of characteristic groups in terms of the types of units producing them: AM-400-500, Ensa AM-200, and so forth. This corresponds to the calculation system for determining the consumption rate of electric power in ammonia production. By analogy a breakdown of the consumption rates by production units in methanol production has been introduced, and so forth.

The item "Release of Effluents" (for the enterprises of the Ministry of Communal Economy) in the range approved in 1977 is divided into two independent items: "Treatment of Effluents" and "Pumping of Effluents." Such a breakdown corresponds to the essence of the basic production processes

and the employed system for calculating the consumption of electric power in terms of the operations involved in the process of the release of effluents (with their treatment), and also simplifies the establishing of the objective functional relationship of the factors determining the effectiveness of the production operation and the use of energy in production.

But since energy is widely used in production processes and it is difficult to establish individually power consumption in the basic and auxiliary processes for the end products and semiproducts, the broadening of the range should have reasonable limits. For each level of planning there should be a corresponding definite number of items in the product range calculated on the basis of the magnitude of the energy intensiveness of the product (type of job). A further widening of the range beyond a certain number of positions, in our opinion, should be carried out by the method of expert evaluations considering the energy intensiveness of the product (type of job), the development state of the system of accounting, reporting and norm setting, and other factors.

It is essential to bear in mind that setting the consumption rates of fuel and energy in the USSR ministries and departments and the Union republic gosplans should encompass the energy-intensive types of products (jobs), since they determine the basic portion of energy consumption and substantially influence its final amount.

Proceeding from what has been stated above, we have anlyzed the influence of the increase in the number of items in the product range on the relative increase in the normed consumption of boiler and furnace fuel, thermal and electric energy both broken down for the allocation holders, as well as for the overall production and operating needs of industry, construction and transportation considering the energy intensiveness of the product and the jobs, the expenditures related to working out the rate-setting procedure and the forming of the consumption rate itself and also considering providing for the accounting and compiling statistical reporting on the fulfillment of the consumption rates for fuel and energy resources and the existing personnel support for this work. The ranges of product and job types shown in the reports according to Forms No 11-sn and No 11-sn (Short) have been set starting with the 1978 report, as follows: 217 items for boiler and furnace fuel, 185 items for thermal energy and 248 items for electric energy.

Due to the lack of the necessary prerequisites for calculating the energy consumption rates for other types of products and jobs not included in this list, in the summary reports according to Forms No 11-sn and No 11-sn (Short), in the second and third sections a normative position has been incorporated which generalizes the other expenditures of energy resources (electric energy and thermal energy) in production "Other Production Consumption," with a standard measurement of the rate on all planning levels, respectively, gigacalories and thousand kilowatts per thousand rubles of product output.

As analysis has shown, the dynamics of the individual consumptions for this indicator for the report year on the level of the USSR ministries and departments basically has a stable nature, while the planned energy consumption rate for other production needs calculated for the cost unit in a majority of instances can be determined by the methods of mathematical statistics.

The changes made in the reports according to the designated forms have a procedural support. They are reflected in the instructions approved by the USSR TsSU in 1978 on the procedure for compiling the reports according to Forms No 11-sn and No 11-sn (Short) as well as in the instructions on the procedure for working out and submitting the summary reports according to Forms No 11-sn--Summary and No 11-sn (Short)--Summary.

One of the key tasks in economic activities at the present stage is the thrifty and rational use of material resources. The collectives of all enterprises and organizations have been involved in the struggle to carry out this task; they have assumed socialist obligations to save fuel and energy.

For obtaining information on the fulfillment of the socialist obligations, in 1978, the USSR TsSU approved an immediate quarterly "Report on the Saving of Material Resources" according to Form No 18-sn. It contains indicators for the amount of the savings of boiler and furnace fuel, thermal energy, electric energy, diesel fuel and gasoline as set in the socialist obligations, as well as indicators for the actual fulfillment of these obligations.

The designated calculation is worked out quarterly in a running total from the start of the report year by all industrial, construction and transport enterprises and organizations, and is submitted 10 days after the report period to their superior organization and to the appropriate statistical administration.

For the purposes of shortening the time for working out and submitting the reports according to Forms No 11-sn and No 11-sn (Short), the summary data on the fulfillment of the consumption rates for fuel and energy and the quotas for reducing them as a whole for the USSR, the ministries and departments are worked out by the Main Computer Center of the USSR TsSU on electronic computers. As a result the times have been shortened for submitting the reporting to the leading and planning bodies.

An analysis of the report data comprises a portion of the work related to their collection, processing and generalization; this makes it possible to detect the characteristic trends in the consumption and use of fuel and energy resources, the reasons for the deviations of actual consumption from the established standards, and the reserves for saving fuel and energy in production, as well as to judge the degree of soundness of the consumption rates.

In a majority of instances, on all planning levels from the enterprises up to the USSR Gosplan, an analysis of data on energy utilization comes down to comparing the actual specific expenditures of fuel and energy in the report year with the established standards. The detection and description of the reasons for deviations from the current power consumption rates are the basis for assessing the results of energy utilization and the work of the personnel in the area of saving fuel and energy. Here on the level of the associations and on higher levels, as a rule, the consolidated specific consumptions are analyzed as well as their corresponding consumption rates for fuel and energy in the production of the product (jobs) over the report year.

In a number of instances such analysis is not concrete, as a consequence of fluctuations in the structure of production producing the same type of product, depending upon the share of one or another production method in the total product output, as well as a result of individual (inherent only to the given enterprise or organization) distribution of the expenditures of thermal and electric energy on auxiliary needs as related to the production of the given product or type of work, particularly in producing diverse products.

To this we must add that in forming both the consumption rates of fuel and energy, as well as their corresponding report data, the production volumes of different-quality products (jobs) and their corresponding expenditures of fuel and energy resources (for example, synthetic resins and plastics or chemical fibers and filaments with all their diverse types are often accounted for as one type of product) are brought together.

The use of consolidated, and hence often not very precise indicators for the use of fuel and energy on all levels of planning (from the associations up to the USSR Gosplan) is explained by the fact that, in the first place, the main task of planning is to determine the current demand for fuel and energy, and secondly, using existing methods the processing of a large amount of data on fuel and energy consumption and the objective distribution of their consumption on producing standard types of one type of product (with the diversity of grades, assortment, and so forth) is a task that is too labor intensive and in practical terms is unfeasible with the present-day level of using computers for the operational and aggregated representation of information on energy utilization in terms of the planning levels.

Regardless of the designated shortcomings, the given method for analyzing data on the use of fuel and energy resources in production in a majority of instances is sufficiently effective, and the influence of the factors which reduce the quality of the analysis can be substantially lowered if, in the process of this, one isolates and considers those structural groups which are employed in practical work, such as: in terms of the composition of products or processes or methods (the "dry" and "wet" methods of producing cement clinker, the contact and tower methods of producing sulfuric acid, and so forth); in terms of types of equipment (boiler-generator

units, steam and hot-water boilers, and so forth); in terms of product types (various types of chemical fibers, plastics, types of rubbers, and so forth); in terms of types of raw materials (production of sulfuric acid from pyrites and from sulfur, the production of vegetable oil from sunflower, cotton or soya seed, and so forth).

In the period up to 1977, the quality of analyzing data on the use of fuel and energy was influenced in a particularly negative manner by the lack of a uniform procedural basis and a uniform organizational procedure for carrying it out. In 1977, the USSR TsSU worked out standard organizational and procedural bases for analyzing data on energy utilization. A scheme of the explanatory note with the analysis results is appended to the instructions on the procedure for compiling the reports according to Forms No 11-sn and No 11-sn (Short) and in the instructions on the procedure for working out and submitting the summary reports according to Forms No 11-sn--Summary and No 11-sn (Short)--Summary. It is provided that the reporting enterprises and organizations (production associations, combines and trusts) should submit an explanatory note with an analysis of the reasons for deviations of the actual expenditure of fuel and energy resources (by types) from the expenditure calculated according to the standards of the report year and the preceding year on the produced product (performed work) for the report year along with the report according to Form No 11-sn, while the ministries and departments would submit the same explanatory note along with the summary report according to Form No 11-sn--Summary.

The use of fuel and energy in production as well as the reserves for saving them can be shown individually for boiler and furnace fuel, oil products used in internal combustion engines, thermal energy and electric energy by analyzing the statistical data of the repot according to Form No 11-sn on the supply of the enterprises and organizations with fuel in terms of quantity, quality and assortment; for the supply of thermal and electric energy; for changes occurring in the report year in the fuel and energy conditions; on fuel and energy losses as a result of producing poor-quality products and heat losses in the heat-using units, thermal networks, and so forth.

In analyzing the data on the consumption of fuel and energy resources, it is essential first of all to disclose the overall results of their use as a whole, that is, to determine the final amounts of the deviations in the actual expenditures of fuel and energy from their corresponding expenditures according to the standards.

The explanatory note should give:

a) Data on the amount of the savings of fuel and energy resources and obtained as a result of carrying out organizational and technical measures during the report year, for example, an improvement in the quality of the methods of using fuel and energy, the production methods of the products (jobs), and so forth;

b) Data on the amount of the overexpenditure of fuel and energy due to a violation of the production process, the nonfulfillment of the plan for organizational and technical measures, the replacing of certain types of fuel by other, less economic ones, losses from rejected products, deliveries of fuel of the improper quality and assortment, and so forth.

To a significant degree the level of work done by the enterprises to save fuel and energy resources depends upon the state of norming their consumption. As was pointed out, many enterprises do not work out consumption rates for fuel and energy resources in producing many types of products. In a number of instances, the rates are set "from the base," that is, on the level of the actual specific consumption of previous years. Here, as a rule, the real possibilities for reducing consumption are not considered.

The absence of approved rates, like the setting of inflated rates, does not create the prerequisites for correctly organizing material and technical supply, it does not encourage the enterprises to make rational and economic use of fuel and energy, and impedes control over their correct consumption and the disclosure of unutilized reserves for saving them.

For this reason, an analysis of statistical data on fuel and energy utilization must be closely correlated with the questions of their norming and all the miscalculations in norm setting made both by the planning bodies and the enterprises and organizations should be reflected in the explanatory note. In particular, attention must be paid to the fact that in setting the consumption of fuel and energy resources upon the level of their amounts actually achieved in a previous period, the irrational expenditures and losses of these resources caused by a deviation from the accepted production methods, operating conditions, formulas, by the nonobservance of the quality requirements of raw products and materials, or by damaged products, as a rule, fall into the rates, although this is not allowed by the "Basic Provisions for Norming the Consumption of Fuel, Thermal and Electric Energy in the National Economy." For this reason, an analysis of the indicators for the use of fuel and energy resources in production on a basis of the report data should be aimed at disclosing such violations in the current system of norm setting in working out the standards. This will help to improve the quality of setting the rates for fuel and energy consumption on all levels of national economic planning and management.

The elaboration of the organizational and procedural bases for analyzing the report data on the fulfillment of the standards and quotas for reducing them is of important significance for creating a unified system for analyzing the energy utilization indicators, as well as for disclosing additional reserves for saving fuel and energy resources in the national economy.

However, as the experience of working out and submitting the report according to Form No 11-sn for 1978 has shown, individual enterprises (organizations) and ministries (departments) do not submit the explanatory note with

an analysis of data on the use of fuel and energy in production, thereby violating the instruction of the USSR TsSU.

For the purposes of further improving the organization and raising the effectiveness of work in the area of analyzing data on the utilization of fuel and energy in production, it is essential that all the reporting enterprises and organizations, the production associations, ministries and departments submit the explanatory notes with an analysis of the causes for the deviation of the actual consumption of boiler and furnace fuel, oil products used in internal combustion engines, thermal energy and electric energy from the consumption calculated according to the rates of the report year and the previous year for the produced product (performed work) during the report year.

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SELECTIVE LIST OF JPRS SERIAL REPORTS

USSR SERIAL REPORTS (GENERAL)

USSR REPORT: Agriculture
USSR REPORT: Economic Affairs
USSR REPORT: Construction and Equipment
USSR REPORT: Military Affairs
USSR REPORT: Political and Sociological Affairs
USSR REPORT: Energy
USSR REPORT: International Economic Relations
USSR REPORT: Consumer Goods and Domestic Trade
USSR REPORT: Human Resources
USSR REPORT: Transportation
USSR REPORT: Translations from KOMMUNIST*
USSR REPORT: PROBLEMS OF THE FAR EAST*
USSR REPORT: SOCIOLOGICAL STUDIES*
USSR REPORT: USA: ECONOMICS, POLITICS, IDEOLOGY*

USSR SERIAL REPORTS (SCIENTIFIC AND TECHNICAL)

USSR REPORT: Life Sciences: Biomedical and Behavioral Sciences
USSR REPORT: Life Sciences: Effects of Nonionizing Electromagnetic Radiation
USSR REPORT: Life Sciences: Agrotechnology and Food Resources
USSR REPORT: Chemistry
USSR REPORT: Cybernetics, Computers and Automation Technology
USSR REPORT: Electronics and Electrical Engineering
USSR REPORT: Engineering and Equipment
USSR REPORT: Earth Sciences
USSR REPORT: Space
USSR REPORT: Materials Science and Metallurgy
USSR REPORT: Physics and Mathematics
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE*

WORLDWIDE SERIAL REPORTS

WORLDWIDE REPORT: Environmental Quality
WORLDWIDE REPORT: Epidemiology
WORLDWIDE REPORT: Law of the Sea
WORLDWIDE REPORT: Nuclear Development and Proliferation
WORLDWIDE REPORT: Telecommunications Policy, Research and Development

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